

Group VII — The Halogens

Q1 Why are the halogens known as the Group VII elements?

Q2 Complete the table below and answer the questions.

Halogen	Number of electrons in outer shell	State at room temperature	Colour at room temperature	Symbol
Fluorine	7			
Chlorine		gas		
Bromine			brown	
Iodine				I

a) Bromine is a brown volatile liquid. What is meant by volatile?

b) Why are the atoms bigger as you go down the group?

c) How does the reactivity change down the group?

Q3 Under atmospheric pressure, chlorine's melting point is -101°C , and its boiling point is -35°C . Between what temperatures would chlorine be a) a Solid b) a Liquid c) a Gas?

Q4 Look at the information in the table.

- a) From the information given, estimate the melting point of iodine.
- b) Describe the patterns (trends) in the melting and boiling points down the group.

Halogen	Melting Point $^{\circ}\text{C}$	Boiling Point $^{\circ}\text{C}$
Fluorine	-220	-188
Chlorine	-101	-35
Bromine	-7	58
Iodine		184

Q5 Fluorine is an atom with this chemical symbol $\rightarrow {}^{19}_{9}\text{F}$

- a) Draw an atom of fluorine from the information given.
- b) On your diagram write down i) the number of protons ii) the number of neutrons
iii) the number of electrons iv) the electronic configuration.

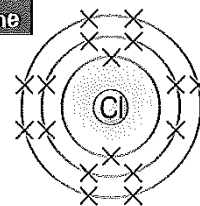
Q6 All the halogens form diatomic molecules.

- a) Explain what is meant by diatomic.
- b) Write the formula for: i) the chlorine molecule ii) the iodine molecule.

Q7 The diagram on the left shows an atom of chlorine.

- a) Draw a molecule of chlorine using this atom to help you.
- b) What type of bonding do we call this?

Atom of Chlorine



Q8 The Halogens also form another type of bond by gaining one electron.

- a) What is this type of bonding called?
- b) What would be the charge on a halogen ion?
- c) Name a compound in which chlorine would gain an electron.
- d) Name a compound in which chlorine would share an electron.

Q9 Draw the atomic structure and write the names of the compounds formed when:

- a) Fluorine combines with lithium, b) Chlorine combines with hydrogen.

Q10 State what type of bonding is found in the following halogen compounds:

- a) Hydrogen fluoride, HF b) Lithium chloride, LiCl c) Tetrachloromethane d) Potassium bromide.
- How can you tell the type of bonding in each? Is there a general rule you followed?

Q11 Fill in the spaces to complete this table:

Halogen	Symbol	No. of Protons	No. of Neutrons	No. of Electrons	Atomic Mass	Atomic Number
Fluorine	F				19	9
Chlorine	Cl	17	18		35	
Bromine	Br	35			80	
Iodine	I				127	53
Astatine	At	85			210	

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- Q12** The reactivity of the halogens decreases down the group, but the reactivity of the alkali metals increases down the group. Explain this difference.
- Q13** Iodine can change easily from a dark grey solid to a purple vapour. It does not become a liquid. What do we call this change?
- Q14** Halogens react with metals to form salts.
- What is a salt?
 - Given that Halogens are poisonous, where should reactions of metals and halogens be carried out?
 - Write in the salts formed from the following reactions:
 - Are the salts ionic or covalent compounds? Explain your answer.

Iron + Chlorine	→	
Aluminium + Bromine	→	
Tin + Chlorine	→	

- Q15** Most halides are soluble, but silver halides are not (e.g. silver chloride). They can be used to test for halide salts because they produce coloured insoluble precipitates.

- What does the term "precipitate" mean?
- What symbol shows a precipitate in a reaction?
- Match the silver halide to the colour of the precipitate formed:
- Look at the reaction below.

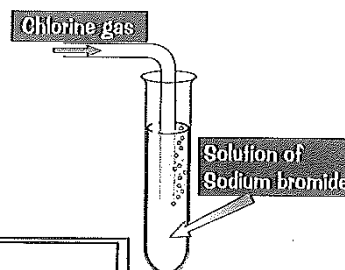
Silver Halide	→	Precipitate
silver chloride		yellow
silver bromide		white
silver iodide		creamy colour



Write equations for the reaction of silver nitrate with: i) sodium bromide ii) sodium iodide.

- Q16** What effect will chlorine gas have on damp, blue litmus paper?
- Q17** You are given a sample of a solid compound marked X, and told it is a halide salt. Explain how you could carry out an experiment to find which halide is present in X.
- Q18** Chlorine is bubbled through sodium bromide as shown in the diagram.

- What would you see happening in the test tube?
- Which of chlorine or bromine is the most reactive?
- How can you explain the results of the reaction?
- Write an equation to explain the reaction.
- Complete the equations below by writing the symbols and balancing them.



i) Fluorine + Sodium iodide	→	
ii) Chlorine + Sodium bromide	→	
iii) Chlorine + Potassium fluoride	→	
iv) Bromine + Potassium iodide	→	

Top Tips:

The halogens' reactivity varies in the opposite way to group I — make sure you understand why. And learn how size, colour and melting and boiling points vary down the group. Then all you need to know is their dangers, how you'd test for them, and their displacement reactions. Nice.